SCIENTIFIC RESEARCH REPORT

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Different views of dentists and general medical practitioners on dental care for patients with diabetes mellitus and coronary heart diseases: results of a questionnaire-based survey in a district of Germany

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Background: The aim of this questionnaire-based study was to evaluate the views of dentists (Ds) and general medical practitioners (GPs) on different aspects of dental care for patients with diabetes mellitus (DM) or coronary heart disease (CHD). **Methods:** Reliable and comparable questionnaires for Ds and GPs, with 23 questions, were sent to 1,000 randomly selected Ds and 1,000 randomly selected GPs. Questions were asked about patients with DM or CHD regarding their dental care and potentially related issues (e.g. antibiotic prophylaxis). The responses received within 12 weeks were evaluated and statistically analysed using chi-square and Mann–Whitney *U* tests ($P < 0.05$). **Results:** The response rate was 39% ($n = 391$) for Ds and 18% ($n = 181$) for GPs. Both groups stated that they used the medical history as well as patient interviews to assess patients. However, only 55% of Ds assumed correct identification of every at-risk patient compared with 100% of GPs ($P < 0.01$). Furthermore, Ds speculated that they inform their patients more often about their at-risk status than do GPs ($P < 0.01$). Neither Ds nor GPs appeared to be confident in their knowledge about adequate antibiotic prophylaxis. Interdisciplinary collaboration was considered insufficient, although Ds had a higher rate of regular collaboration (68% for Ds *vs.* 40% for GPs; $P < 0.01$). **Conclusion:** Ds and GPs have differing views on dental care of patients with DM or CHD, and Ds showed more interest in this issue. These results might partially explain the insufficient collaboration between Ds and GPs.

Key words: *Dental care, interdisciplinary collaboration, diabetes mellitus, coronary heart diseases*

INTRODUCTION

There is a close relationship between oral health and systemic health[1]. On the one hand, systemic diseases, such as diabetes mellitus (DM), might be accompanied by pathological oral findings and/or may foster development and progression of oral diseases[1–3]. On the other hand, poor oral health, especially in the case of periodontal diseases (gingivitis and periodontitis), can influence systemic diseases such as DM and coronary heart diseases (CHDs)[1–4]. Patients affected by these conditions are so-called at-risk patients. Patients with CHD must be considered as especially at risk, in particular if they have an increased risk of developing endocarditis[5].

There is a bidirectional association between DM and periodontitis[3,6,7] as DM accelerates development as well as progression of periodontitis and enhances its severity[8]. Moreover, periodontitis makes it more difficult to control blood sugar levels in DM and increases the risk of complications associated with diabetes[7,9]. Successful periodontal therapy, however, can have a positive effect on the normalisation of blood sugar[10]. These findings indicate the need for targeted patient information and treatment management, with close collaboration between dentists (Ds)

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and general medical practitioners (GPs)[3]. Accordingly, Deschner *et al.* emphasised interdisciplinary collaboration between Ds and GPs when treating patients with DM[11].

Infective endocarditis can be associated with poor oral health and a need for dental interventions[12,13]. Consequently, the current guidelines of the American Heart Association, for antibiotic prophylaxis during dental interventions, are considered mandatory in the prevention of endocarditis[14]. Furthermore, associations between CHDs (arteriosclerosis, myocardial infarction) and periodontitis are supported by the literature[15]. To minimise the cardiovascular risk and optimise risk-oriented support, close cooperation between Ds and GPs should be pursued for this patient group[16].

These known correlations make interdisciplinary collaboration between Ds and GPs highly desirable and it is a worthy goal for both to obtain information on existing risk factors[6,16,17]. In particular, Ds should be informed about their patients' diseases and medications to ensure the safety of their patients and provision of low-risk treatment. However, an insufficient degree of interdisciplinary collaboration between Ds and GPs has been reported in the literature[18–20]. To date, the reasons for this unsatisfactory situation have been unclear.

Against this background, the aim of the present questionnaire-based study was to evaluate the different views on dental care for patients with DM or CHD between Ds and GPs within a district of Germany. The following working hypothesis was formulated: There is no target-oriented collaboration between Ds and GPs regarding care of these at-risk patients. This might be caused by different views regarding the dental care of this group.

METHODS

Design and validation of the questionnaires

This representative survey based on anonymous questionnaires with four item batteries, using closed response modes with binary- or multiple-choice and open-ended questions, was administered to Ds and GPs in Lower Saxony, Germany. The study was approved by the Ethics Committee of the University Medical Center Goettingen, Goettingen, Germany. The Ethics Committee decided that a detailed review process would not be necessary because no treatment was provided. The questionnaires were answered anonymously, and with the return of the questionnaires, all participating Ds and GPs gave their written informed consent. The examination was conducted in full accordance with the World Medical Association's Declaration of Helsinki. The internal consistency and reliability were tested within a pilot study involving 10 Ds and 10 GPs, who completed the questionnaire twice within 1 week. The test–retest reliability was found to be substantial (mean Cohen's kappa: Ds = 0.726, GPs = 0.688; Kendall's tau: Ds =0.755, GPs = 0.712; Cronbach's alpha: Ds = 0.815, GPs = 0.796).

Selection of the participants

No power calculation was performed as a basis for this study, and the appropriate effect size could not be deduced from the literature. Accordingly, the authors decided to send 1,000 questionnaires to each group to guarantee at least 250 responses based on an assumed minimum response rate of 25%. For this investigation, 1,000 Ds and 1,000 GPs from Lower Saxony, Germany, were contacted via post and asked for their voluntary participation in the survey. The Ds and GPs were selected randomly from among all registered Ds and GPs within the Dental and Medical Associations of Lower Saxony. At first, a random sample of 1,000 GPs of the Medical Association of Lower Saxony was selected. In this sample, several GPs from metropolitan (>50,000 inhabitants), urban (10,000–50,000 inhabitants) and rural (<10,000 inhabitants) areas of Lower Saxony were included. Based on this GP sample, the D sample was established randomly according to matching criteria (location/postal code) as well as setting (metropolitan area, urban area or rural area). Solo and group practices could be included, with group practices statistically treated as single practitioners.

Questionnaires and implementation of the survey

Within this investigation, comparable questionnaires for Ds and GPs, with 23 questions distributed in four item batteries, were utilised. Closed response modes with binary-choice (dichotomous yes/no mode), multiple-choice (given answer options) and open-ended questions were used (*Table 1*), but multiple answers were occasionally possible. The content of the questionnaires varied as little as possible between the two groups, to ensure comparability. However, the questionnaires did contain specific questions for each participating group [e.g. for Ds, about the possibility of blood pressure and blood glucose measurements being made within the dental practice and the assessment of risk characteristics before dental treatment and, for GPs, about the known extent of the correlations of periodontitis with DM and CHDs, consideration of the oral health situation of the patient and the identification of oral diseases (changes in the mucous membranes, gingivitis, periodontitis)]. Each questionnaire could be completed in less than 10 minutes.

Table 1 Questionnaire design and items included

Item	Complex	Content
1	Demographic information	Professional experience Practice form (solo or group practice) Practice setting (rural, urban, or metropolitan)
2	Detection and management of at-risk patients	Detection and medical history form Interdisciplinary/referral behaviour Topic-specific patient information/ raising of awareness
3	Antibiotic prophylaxis	Responsibility Range of indications Choice of medication
4	Collaboration between dentists and practitioners	Existing collaboration or network Quality of network Request for establishing a network or improvement Rating of dental and medical knowledge (external and self-assessment)

The questionnaires were sent via post, together with personalised cover letters (providing information about the study), to all selected Ds and GPs registered within the Dental or Medical Association of Lower Saxony (n = 1,000 each group); additionally, an unstamped preaddressed reply envelope was enclosed. The survey was closed 12 weeks after the delivery of the questionnaires. Because of the anonymous character of this study, non-responders could not be sent reminders.

Statistical analysis

The data from the returned questionnaires were transferred into a database by one examiner. The statistical analyses were performed using the software Statistica (StatSoft GmbH, Hamburg, Germany) to apply chi-square or Mann–Whitney U tests. The level of significance was set at $P < 0.05$.

RESULTS

Demographic data of the participating practices

The response rate was 39% (n = 391) for Ds and 18% (n = 181) for GPs. Participants in both groups originated from different settings to the same extent (*Table 2*). The Ds worked more frequently in solo practices ($P < 0.01$; *Table 2*).

Information about the detection and referral of at-risk patients

Both Ds and GPs primarily mentioned evaluation of medical history or doctor–patient conversation as a means for detecting at-risk patients ($P < 0.01$; *Table 3*). Overall, 63% of Ds and 41% of GPs reported that they updated the medical history every 1–2 years, and 60% of Ds and 48% of GPs did so if they were given new information by the patient. In total, 55% of Ds reported that they always knew whether they were treating an at-risk patient (with DM or CHD) compared with 100% of GPs ($P < 0.01$, data not shown).

Overall, 84% of GPs reported that they treated more than 50 at-risk patients per quarter compared with 33% of Ds, and 63% of Ds stated that they treated fewer than 50 at-risk patients per quarter ($P < 0.01$). Whereas 30% of Ds reported more than 10 referrals per quarter, 20% of GPs declared regular receipt of referrals of patients with DM and CHD from Ds. Furthermore, 11% of GPs reported referrals of more than 10 patients per quarter, and 38% of the Ds reported referrals from GPs of these patients ($P < 0.01$, data not shown).

Table 2 Demographic data of participating dentist (D) and general practitioner (GP) practices

Characteristic	Dentists (n = 391)	General practitioners (n = 181)
Practice form		
Solo	60 (234)	50 (91)
Group	35 (137)	45 (81)
Other	5 (20)	5 (9)
Practice setting		
Rural	66 (259)	63 (114)
Urban	28 (109)	32 (58)
Metropolitan	6 (23)	5 (9)
Professional experience in years		
Up to 10	7 (28)	6 (11)
10–20	30 (117)	27 (49)
20–30	39 (152)	34 (61)
Over 30	24 (94)	33 (60)

Values are given as % (n), where n is the number of participants.

Table 3 Detection of at-risk patients with a history of diabetes mellitus (DM) or coronary heart disease (CHD)*

Variable	Dentists (n = 391)	General practitioners (n = 181)	P-value
Medical history	98 (383)	55 (100)	<0.01
Doctor–patient communication	96 (375)	99 (179)	0.83
Risk certificate	84 (328)	49 (89)	<0.01
Demand on desk	45 (176)	31 (56)	0.1
Medical referral	39 (152)	67 (121)	<0.01
Unclear	1 (4)	4 (7)	0.17

*Values are given as % (n), where n is the number of participants. Multiple responses are allowed.
CHD, coronary heart disease; DM, diabetes mellitus.

Table 4 Patient information and classification as at-risk patients

Variable	Dentists (n = 391)	General practitioners (n = 181)	P-value
Patient information about known correlations*			
General	90 (352)	38 (69)	<0.01
Conversation	96 (338/352)	81 (56/69)	
Brochure	32 (113/352)	14 (9/69)	
Medical referral	47 (165/352)	31 (21/69)	
Undefined	9 (32/352)	15 (10/69)	
Pointing out the need for a consultation with a dentist/physician to the patient	90 (352)	57 (103)	<0.01
Motivation of the patient for consultation with a dentist/physician	70 (274)	56 (101)	0.2

Values are given as % (n), where n is the number of participants.
*Multiple responses are allowed.

Table 5 Details about recommended antibiotic prophylaxis (determination, indication)*

Variable	Dentists (n = 391)	General practitioners (n = 181)	P-value
Determination of antibiotic prophylaxis			
General practitioner	68 (266)	68 (123)	<0.01
Dentist	53 (207)	72 (130)	
Guidelines (DGK, DGZMK)	47 (184)	50 (91)	
Internist	81 (317)	45 (81)	
Indication: Dental intervention			
General	6 (23)	6 (11)	0.08
Conservative treatment	28 (109)	15 (27)	
Endodontic treatment	29 (113)	29 (52)	
Professional tooth cleaning	37 (145)	17 (31)	
Periodontal treatment	49 (191)	35 (63)	
Oral surgery	55 (215)	41 (74)	

Values are given as % (n), where n is the number of participants.
*Multiple responses are allowed.
DGK, German Society of Cardiology; DGZMK, German Society of Dentistry and Oral Medicine.

Managing at-risk patients and antibiotic prophylaxis

According to the reports, Ds informed their patients significantly more often than GPs about the correlations of oral health with both DM and CHDs. Furthermore, Ds reported that they recommended appointments with physicians more often ($P < 0.01$; *Table 4*). Regarding determination of the need for antibiotic prophylaxis, neither Ds nor GPs provided a clear answer (*Table 5*). Additionally, different recommendations for antibiotics were given; most often, amoxicillin (D: 68%, GP: 36%) and clindamycin (D: 33%, GP: 12%) were prescribed.

Collaboration and networking

In *Table 6*, the results for collaboration and networking are summarised. In total, 68% of Ds and 40% of GPs reported that they collaborated regularly with practitioners in the other discipline ($P < 0.01$). In this context, interdisciplinary networks do exist, but only to a small extent (Ds: 21%, GPs: 6%; $P < 0.01$). According to the reports of the participating Ds and GPs, their counterparts' expert knowledge about the subject area of the other professional group is not sufficient. However, GPs gave Ds a better rating ($P < 0.01$; *Table 6*). Furthermore, 38% of Ds claimed to have sufficient medical knowledge compared with 19% of GPs who claimed to have sufficient dental knowledge ($P < 0.01$).

Table 6 Networking and interdisciplinary collaboration

Variable	Dentists (n = 391)	General practitioners (n = 181)	P-value
Regular direct collaboration (Ds and GPs)	68 (266)	40 (72)	<0.01
Good network for emergencies (Ds/GPs in the immediate neighborhood can be consulted)	64 (250)	19 (34)	<0.01
Own D/GP network for at-risk patients established	21 (82)	6 (11)	<0.01
Establishing a network or improvement	83 (325)	63 (114)	0.09
Good network of Ds/GPs in Germany	23 (90)	10 (18)	0.02
Network not necessary	6 (23)	23 (42)	<0.01
Interdisciplinary knowledge of the other subject area (external assessment)	7 (27)	21 (38)	<0.01
Interdisciplinary knowledge of the other subject area (self-assessment)	38 (149)	19 (34)	0.01

Values are given as % (n), where n is the number of participants.
Ds, dentists; GPs, general practitioners.

DISCUSSION

Summary of the main results

The response rate was considerably higher among Ds than among GPs. Although both groups regularly collected medical histories and used doctor–patient interviews, only 55% of Ds reported having identified every at-risk patient (with DM or CHD), compared with 100% of GPs. According to the survey, Ds believed that they had fewer at-risk patients compared with GPs. Furthermore, Ds reported to refer more patients to GPs and to inform their patients more frequently than GPs about their status as at-risk patients. Regarding knowledge about antibiotic prophylaxis, the results for both groups were vague, showing noticeable heterogeneity. Neither Ds nor GPs appeared to be confident regarding this topic. Although both groups stated that interdisciplinary collaboration is necessary, Ds seem to be more strongly committed to establish and maintain such cooperation.

Comparison of the findings with the literature

The present study provides insight into different topics relevant to Ds and GPs in their daily practice and interdisciplinary collaboration. One aspect is that despite collecting medical histories and communicating with their patients, only 55% of Ds stated that they identify every at-risk patient (with DM or CHD). The medical history of patients, however, is very important for identifying at-risk patients in dental practice, serves as a basis for dental treatment and should be updated at each visit[21–23]. Moreover, the combination of a written medical history and doctor–patient communication is an effective method for gaining relevant information about patients' health[23]. Only 63% of Ds in the current study updated their medical histories periodically. It is also known that different questions about the medical history might lead to more or less effective identification of at-risk patients[22]. Consequently, inconsistent updates and the use of non-standardised medical history forms could result in identification of fewer at-risk patients. This possibility is supported by the estimation of a significantly lower number of at-risk patients by Ds compared with GPs in the present study. Efurd *et al.* also found a lack of risk assessment of patients with diabetes in Arkansas, USA[24]. This was also reported to be present in New Zealand[25]. Therefore, it can be concluded that increased activity in the management of these at-risk patients is required. This issue should be considered important, because the number of (known and unknown) cases of diabetes is increasing[25]. In this context, Ds could play an important role in the early detection and management of unknown cases of diabetes[26,27]. Based on the results of the present study, this goal is currently not met, which is also important for patients with CHD.

In contrast to this problem, in the present study, Ds stated that they referred more patients than GPs. Moreover, when comparing both groups, Ds declared more frequently that they informed their patients purposefully about their status as at-risk patients. However, the Ds' self-assessment might have been an overestimation. In contrast, the literature indicates that patients with DM[28,29] or CHD[30] have insufficient knowledge about their status as at-risk patients and the necessity of special care. This issue is also apparent in other at-risk groups, such as patients before and after organ transplantation[31,32]. Consequently, increased attention and care from Ds are needed.

One of the main issues in the current study was the marked heterogeneity found about knowledge concerning antibiotic prophylaxis. In both groups, knowledge about the correct prophylaxis appears to be inadequate, although an international guideline and a corresponding national guideline are available[14,33]. These findings are in agreement with other studies. For Ds, insufficient knowledge regarding the recent recommendations on antibiotic prophylaxis has also been shown[34,35] and the present study was able to confirm this finding for German Ds. Moreover, inadequate knowledge of GPs was also found in this regard.

This finding identifies a major problem. As supported by the results of the present study, inadequate interdisciplinary collaboration between Ds and GPs is apparent. The scope of this problem is evidenced by findings in the literature suggesting that increased knowledge and interdisciplinary collaboration are needed for the care both of patients with DM and those with CHD[18–20,23]. This conflict between demand and reality might be caused by different factors, which can be derived from the present study's findings. First, only 18% ($n = 181$) of GPs answered the questionnaire, whereas at least twice as many Ds did so. This result implies low concern for dental care of at-risk patients, especially among GPs, and indicates that views on dental care for patients with DM or CHD might differ, with GPs apparently attaching little importance to this issue. However, even the number of Ds willing to participate was too low. Second, both groups stated realistically that the networking between Ds and GPs is not good, and at least 83% of the Ds and 63% of the GPs saw a need for improvement.

These results are unsatisfactory, especially when considering the increasing numbers of patients with DM or CHD, with a need for collaborative care[36,37]. Consequently, a major goal of future dental care for patients with DM and CHD in Germany is to improve collaboration between Ds and GPs. Apparently this is feasible, as it has been shown that Ds in particular are knowledgeable with regard to this issue[38]. Therefore, interdisciplinary collaboration should become a basic component of dental education[39]. This topic should also be addressed in the medical education of GPs.

Strengths and limitations

To the best of the authors' knowledge, this is the first investigation of differences in aspects of care for patients with DM and CHD between Ds and GPs in Germany. Therefore, the present study presents new data. The study is limited by the fact that it was based on questionnaires and reflects only the subjective estimations of the responding Ds and GPs, not necessarily the complete practice community. The questionnaires were tested in a pilot study for internal consistency and reliability, but validation by experts who had reviewed the questionnaires and evaluated whether the questions effectively capture the topic under

investigation would have strengthened the protocol. Similarly, the study was not performed throughout Germany, but rather only in Lower Saxony; thus, the results are not necessarily representative of Germany in general. The test–retest reliability of the questionnaire indicated substantial reliability, and a large random sample was investigated. However, the absence of a power calculation is a limitation of the study. In this context, the low response rate for the 1,000 questionnaires submitted to each group must be noted; this is an important limitation and a potential source of bias that must be considered when interpreting the results. However, this is also an important result as it reflects the generally low interest of Ds, and especially GPs, regarding this topic.

CONCLUSION

Improvement of interdisciplinary collaboration between Ds and GPs is necessary. The view regarding dental care for patients with DM or CHD is different comparing Ds and GPs, whereby the interest regarding this issue appeared higher among Ds. This finding might partially explain the insufficient collaboration between Ds and GPs. Furthermore, knowledge about the guidelines for antibiotic prophylaxis and their consequent implementation is inadequate for Ds and GPs, which requires correction.

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Conflict of interest

The authors declare no conflict of interest.

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